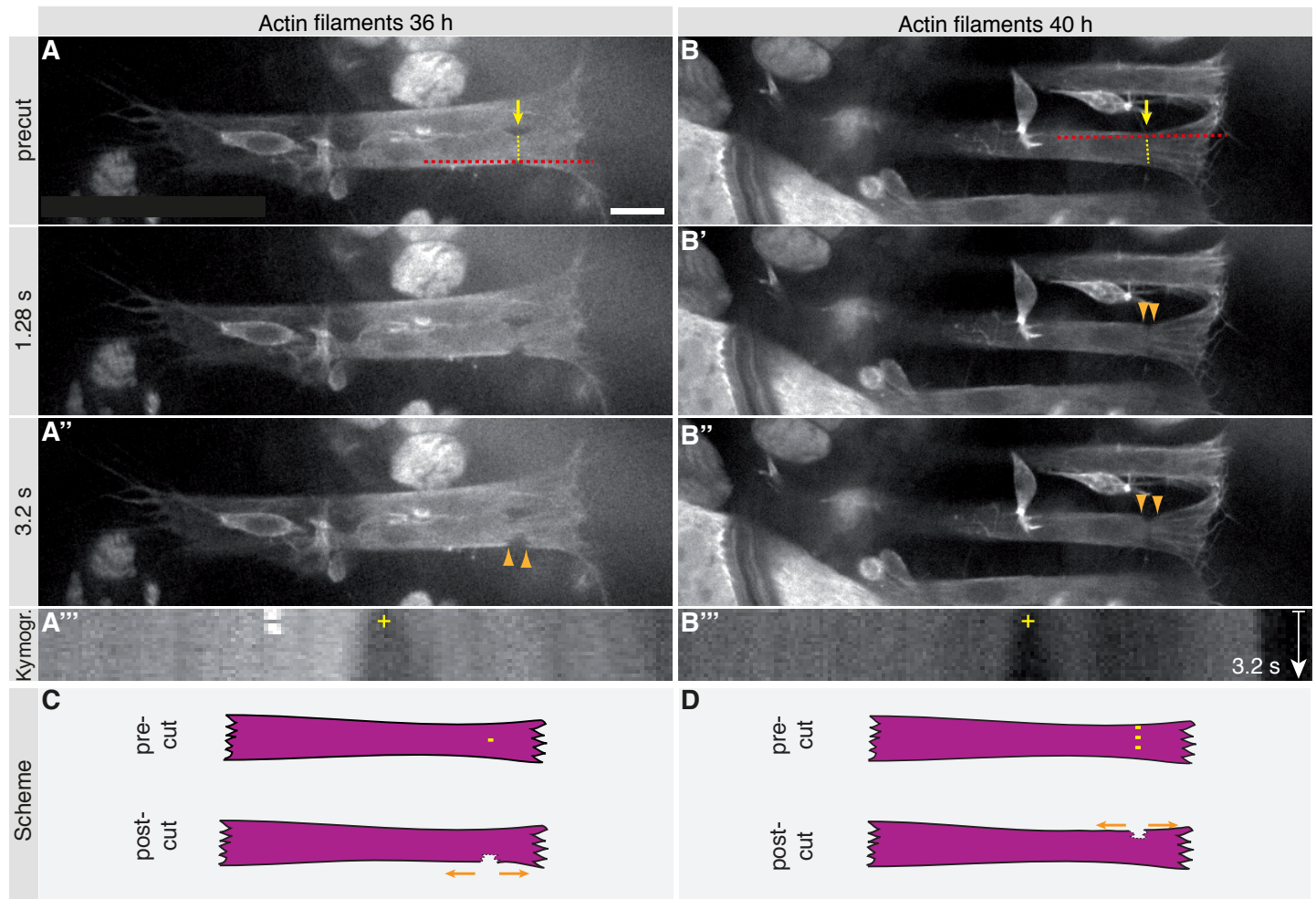


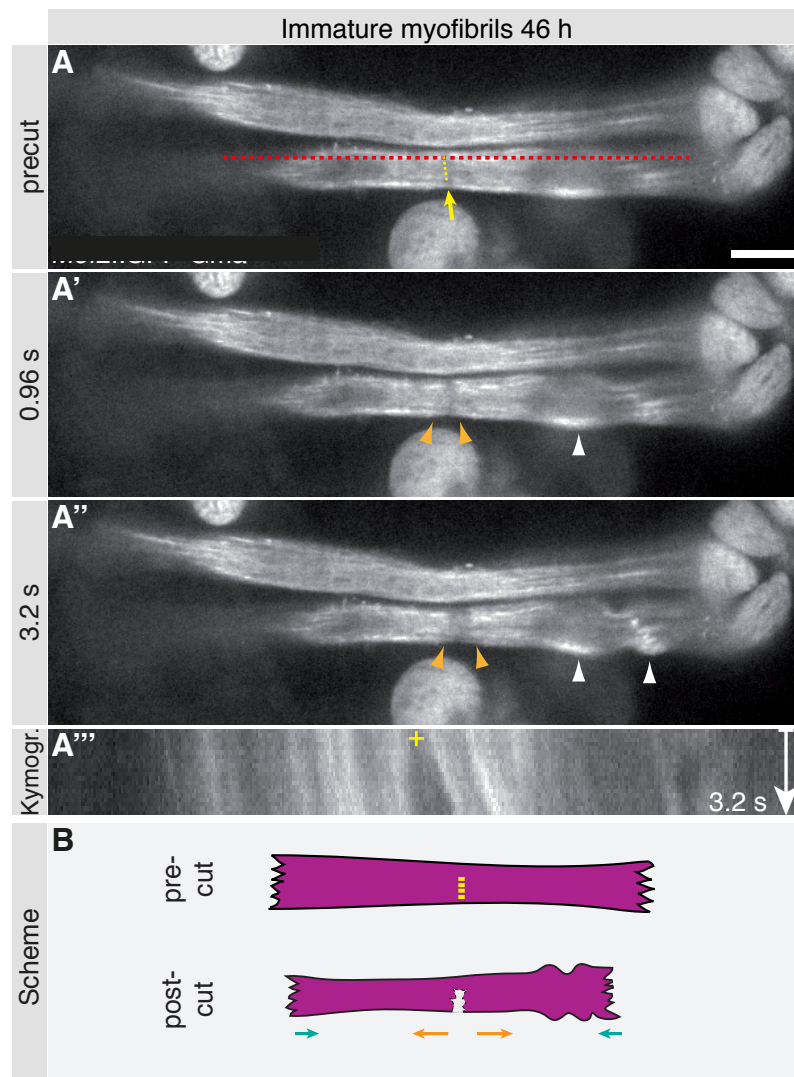
**Supplementary Figure 1. Attachment of *Drosophila* adult body muscles**

(A - F) Dissected wild-type abdomen at 36 h (A), 40 h (B), 46 h (C), 52 h (D), 56 h (E) and 72 h APF (F). Actin (green) and  $\beta$ -Integrin (red) were labelled with phalloidin and anti- $\beta$ -PS-Integrin antibodies, respectively. (A'- F') Magnifications of anterior myotube tips at respective time points;  $\beta$ -Integrin is accumulating at smoothing myotube tips over time (arrowheads). (A''- C'') Anterior tips at high magnification and high Actin gain; Myotubes are attached to the epidermis at 40 h and 46 h APF. Scale bars 25  $\mu$ m (A - F), 5  $\mu$ m (A' - F', A'' - C'').



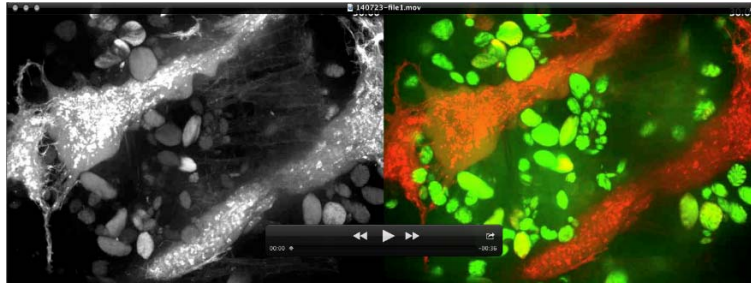
### Supplementary Figure 2. Abdominal body muscles develop under tension

(A - B'') Time points from spinning disc confocal movies of myotubes labelled by *Mef2-GAL4, UAS-GFP-Gma* at 36 h and 40 h APF before (A, B) and after partial myotube severing using laser cutting (A' - B'', Movies 5, 6). Wounded ends (orange arrowheads) move away from the cutting site (yellow lines in A, B). (A''', B''') Kymographs of movies 5 and 6 displaying intensities at the red lines indicated in A and B. (C, D) Schemata of the laser cuts, myotube movement after laser severing is indicated with arrows. Scale bar 10 μm.



### Supplementary Figure 3. Laser-induced myotube contractions during development

(A - A'') Time points from spinning disc confocal movie of myotubes labelled by *Mef2-GAL4*, *UAS-GFP-Gma* at 46 h before (A) and after partial myotube severing using laser-cutting (A', A'', Movie 7). Wounded ends (orange arrowheads) move away from the cutting site (yellow line in A). Induced bulges are marked by white arrowheads. (A''') Kymograph of Movie 7 displaying intensities at the red line indicated in A. (B) Scheme of the laser cut; myotube movement after laser severing is indicated with arrows. Scale bar 10  $\mu$ m.



**Movie 1. Simultaneous sarcomerogenesis in *Drosophila* abdominal body muscles**

Z-projection of spinning disc confocal movie of developing dorsal abdominal muscles expressing Lifact-Ruby (red) and Mhc-GFP (green) shown as merge on the right and Lifact-Ruby in grey on the left. Note the simultaneous establishment of the periodic Mhc-GFP pattern. Large red structures are remaining and degrading larval muscles. Movie plays with 5 frames per second. Time is indicated in hh:mm APF.



### **Movie 2. Formation of striated abdominal body muscles**

Z-projection of a multi-photon movie showing developing dorsal abdominal muscles expressing Mhc-GFP. Note the simultaneous establishment of the periodic Mhc-GFP pattern that aligns at about 52h APF across the entire muscle. Round moving cells are hemocytes digesting larval Mhc-GFP. Movie plays with 5 frames per second. Time is indicated in hh:mm APF.



### **Movie 3. Myotubes at 36 h APF are under mechanical tension**

Single plane spinning disc confocal movie of two myotubes labelled by *Mef2-GAL4*, *UAS-GFP-Gma* at 36 h. The lower one is cut with a UV laser. Note the recoil of the wounded ends and also the movement of the distal myotube ends. Time is indicated in seconds and starts at the cut. Movie plays with 5 frames per second.



#### **Movie 4. Myotubes at 40 h APF are under mechanical tension**

Single plane spinning disc confocal movie of a myotube labelled by *Mef2-GAL4*, *UAS-GFP-Gma* at 40 h, which is cut with a UV laser. Note the recoil of the wounded ends and also the movement of the left distal myotube end (the right end is not visible in this single plane). Time is indicated in seconds and starts at the cut. Movie plays with 5 frames per second.





### **Movie 5. Myotubes at 36 h APF are under mechanical tension**

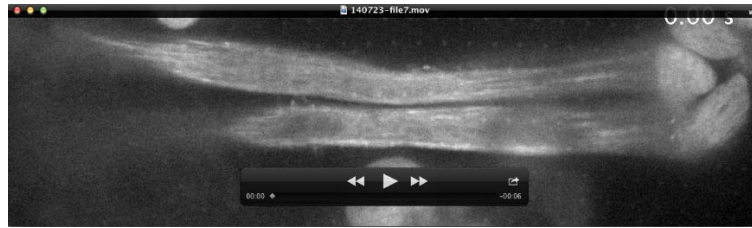
Single plane spinning disc confocal movie of two myotubes labelled by *Mef2-GAL4*, *UAS-GFP-Gma* at 36 h; the lower one is partially severed by a UV laser at the right side (see Supplementary Figure 2). Note the recoil of the wound indicating tension. Time is indicated in seconds and starts at the cut. Movie plays with 5 frames per second.



**Movie 6. Myotubes at 40 h APF are under mechanical tension**

Single plane spinning disc confocal movie of three myotubes labelled by *Mef2-GAL4*, *UAS-GFP-Gma* at 40 h. The middle one is partially severed by a UV laser at the right side (see Supplementary Figure 2). Time is indicated in seconds and starts at the cut.

Movie plays with 5 frames per second.



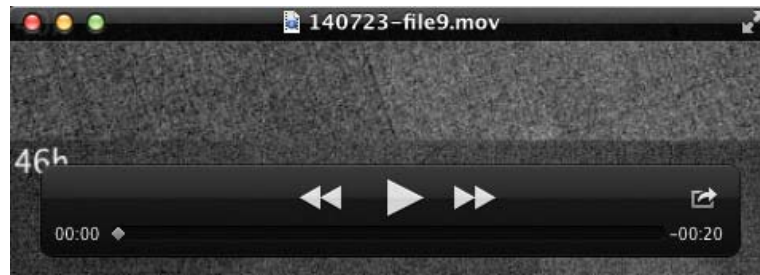
**Movie 7. Myotubes at 46 h APF are contractile upon laser lesion**

Single plane spinning disc confocal movie of two myotubes labelled by *Mef2-GAL4*, *UAS-GFP-Gma* at 40 h. The lower one is partially severed by a UV laser in the middle (see Supplementary Figure 3). Note the induced contraction after the cut. Time is indicated in seconds and starts at the cut. Movie plays with 5 frames per second.



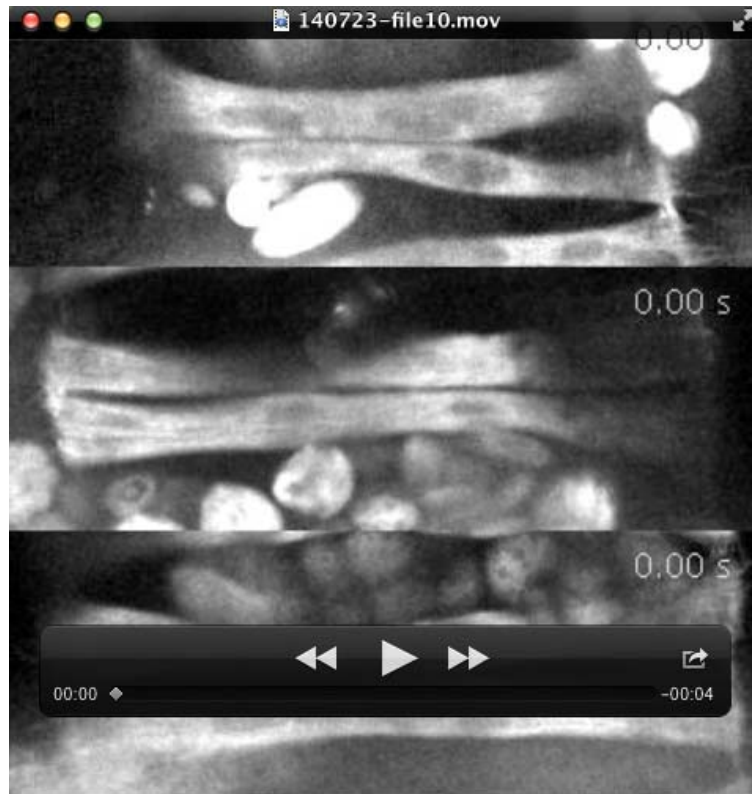
**Movie 8. Myotubes at 46 h but not 40 h APF are contractile upon laser lesion**

Single plane spinning disc confocal movies of myotubes labelled by *Mef2-GAL4*, *UAS-GFP-Gma* at 40 h (upper movie) and 46 h APF (lower movie). The muscles in the center of the movies were severed by a UV nano-lesion (see Figure 6 A, B). Note the induced contraction after the cut at 46 h but not at 40 h APF. Time is indicated in seconds and starts at the cut. Movies plays with 5 frames per second.



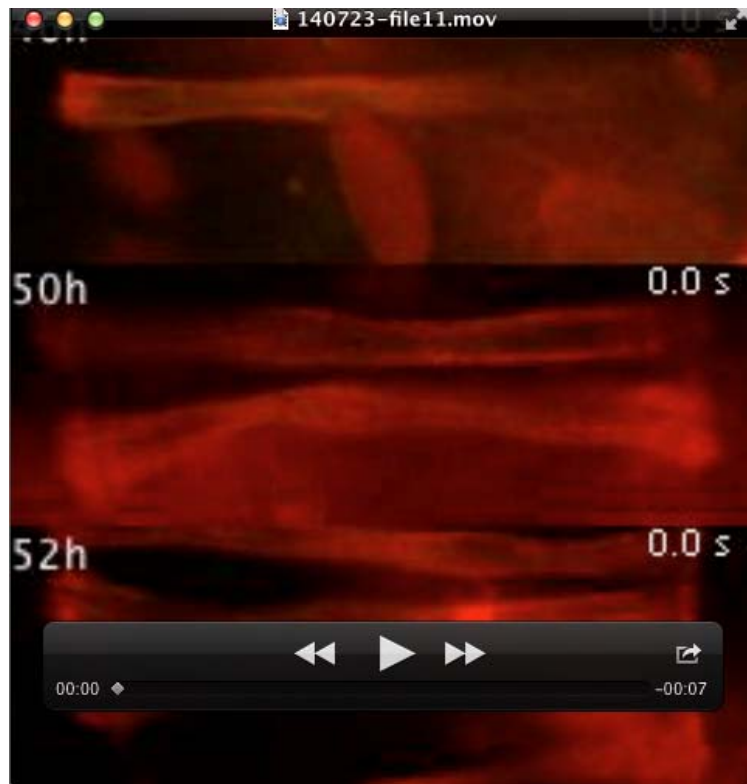
### **Movie 9. Laser severing induces Ca<sup>2+</sup> release**

Single plane spinning disc confocal movies of myotubes labelled with *Mef2-GAL4*, *UAS-GCaMP6* at 40 h (upper movie) and 46 h APF (lower movie). Both muscles were severed by a UV nano-lesion (see Figure 6 E, F). Note the induced Ca<sup>2+</sup> release at both time points, with induced contraction only at 46 h APF. Time is indicated in seconds and starts at the cut. Movies plays with 10 frames per second.



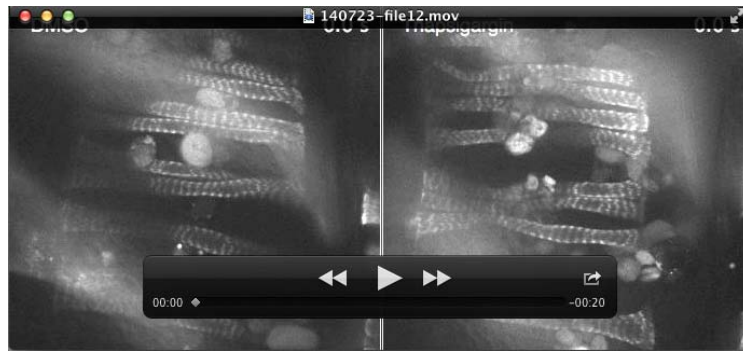
### Movie 10. Optogenetically induced muscle contractions

Single plane spinning disc confocal movies of myotubes labelled with *Mef2-GAL4*, *UAS-GFP-Gma* and *UAS-Channelrhodopsin* at 46 h (upper movie), 50 h (middle) and 52 h APF (lower movie).  $\text{Ca}^{2+}$  influx is induced while imaging with 488 nm laser light and induces a small contraction at 46 h APF and strong contractions at 50 h and 52 h APF. Time is indicated in seconds. Movies plays with 10 frames per second.



### Movie 11. Spontaneous muscle contractions

Single plane spinning disc confocal movies of myotubes labelled with *Mef2-Gal4*, *UAS-Lifeact-Ruby* and *UAS-GCaMP6* at 46 h (upper movie), 50 h (middle) and 52 h APF (lower movie). Spontaneous  $\text{Ca}^{2+}$  influx is found at all stages, and induces a small contraction at 46 h APF and strong contractions at 50 h and 52 h APF. Time is indicated in seconds. Movies plays with 5 frames per second.



### Movie 12. Thapsigargin blocks muscle contractions

Single plane spinning disc confocal movies of myotubes labelled with *Mef2-Gal4*, *UAS-Lifeact-Ruby* and Mhc-GFP (not shown), either injected with DMSO (left movie) or with Thapsigargin (right movie) at 52 h - 53 h APF and imaged at 55 h APF. Time is indicated in seconds. Movies plays with 10 frames per second.